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From climate models to informing policy decisions: the end-to-end importance of an effective research infrastructure

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The last few decades have seen a range of advances in climate science and consequential policy initiatives at both national and international levels. These advances have been built on the back of progress in modelling and in part been enabled by the global data sharing initiative - the Earth System Grid Federation (ESGF) - which has underpinned recent phases of the World Climate Research Programme's Coupled Model Intercomparison Projects.

The ESGF itself consists of data nodes deployed by individual modelling centres and a backbone of software development and services delivered by a few core institutions. Within Europe, along with some shared development of model components, these core ESGF software development and services are coordinated by the European Network on Earth System Modelling (ENES) and supported by the H2020 IS-ENES Phase 3 research infrastructure project.

We provide an historical overview on advances in policy-relevant science, such as the Intergovernmental Panel for Climate Change (IPCC), that have been enabled by long-term underpinning development and funding of the ENES and ESGF infrastructure. We illustrate the recent shift of research funding from physical science objectives alone towards funding services to society (and the necessary underpinning research). We stress the potential dangers of

underfunding research infrastructures that need to be simultaneously flexible and reliable enough to serve both ongoing basic research and the growing societal objectives, as emphasised by the development of climate services such as Copernicus Climate Change Service. We conclude by presenting some steps towards sustaining such research infrastructure in the context of the ENES and the possible futures of climate science.